Report for 2001ID4541B: Integrated Drinking Water Protection on the Clearwater Plateau of Idaho, including the Nez Perce Tribe Reservation

- Conference Proceedings:
  - "Community-Directed Water Resource Protection on the Clearwater Plateau, Within the Nez Perce Tribe Indian Reservation" by Owen, Jankowski, Hamilton and Williams, at the Connections 2001: Idaho's Groundwater Technical Conference, Boise ID, Oct. 1-2, 2001.
- Other Publications:
  - Pending, "Community Designed Graphic Tools for use in Protecting Drinking Water Sources."

Report Follows:

Problem and Research Objectives:

Many costly initiatives and programs have been developed to protect drinking water, and much good information has been generated that details the location and extent of the problems. However, there exists no easy format for land users and community members to access this information in a way that is easily usable. Without the needed information, there is often little motivation for community members to initiate protective measures. Drinking water, especially groundwater, can often take a long time to become degraded – and at that point may be virtually impossible to restore. For these reasons and others, protection plans can become a "paper exercise", something that ranks lower than more obviously urgent matters. Although the procedure for implementing a community drinking water source protection plan has been well established, finding tools to bring the geologic and water quality information to these communities in a way that will help them easily visualize and identify problems and compare management tools could do much to interest and motivate these groups toward proactive and truly action-oriented solutions.

This is particularly important in a demographically complex area such as the Clearwater Plateau in north central Idaho, including the Nez Perce Tribe Indian Reservation. While jurisdictional boundaries exist between such entities as States and Tribes, and must be recognized, the areas are hydrogeologically linked – complicating protection efforts. Non-point source water quality problems such as high nitrate levels in surface water and in at least one deep aquifer (Bentz, 1998, and Crockett, 1995) on the Clearwater Plateau have driven the need for Federally mandated programs such as Total Maximum Daily Load development and Sourcewater Assessments. Significant reaches of Lapwai Creek and the Clearwater River are believed to recharge the Columbia River Basalts, the host formation of the productive drinking water aquifers in the region.

This project benefits north-central Idaho municipalities, the Nez Perce Tribe, the State of Idaho and Federal natural resource managing entities by the distribution and integration of protection information. It will link available land use and water quality information with the knowledge and priorities of the people that live in the area.

How to protect the drinking water source is a major issue facing many communities around the world. The flexible process used to determine these localized informational needs and the creation of simple and effective visualization tools can be transferable to other area and countries, with specific applicability to other areas with complex cultural and ownership patterns.

Nature of Research: Communities in the area known as the Clearwater Plateau in north central Idaho, which includes the Nez Perce Tribe Indian Reservation will volunteer to help develop graphic tools that will be useful in determining water protection problems and solutions.

Methodology:

Volunteer Community Identification

The study area lies within the boundaries of the Nez Perce 1836 Treaty Reservation Boundaries. The land base of the reservation is 750,000 acres, with 12% tribally owned and the rest privately owned. Land use is 50% crop and 27% grass/brush that is often used for range (Spatial Dynamics, 1999). It is generally bounded at the north and east by the main stem Clearwater River, at the west by the Sweetwater Creek drainage (east of Lewiston) and at the south in a line between the Waha area and Harpster.

The study focus is on communities that lie within the reservation boundaries. Communities and population are defined as listed in the U.S. Census 2000 (Census, 2001), and as having a water source that serves that community. Twelve communities were thus identified as potential volunteers.

Water source is the chief supply of water that serves the community (IDEQ Lewiston Regional Office, Sept. 2000). The State of Idaho Department of Environmental Quality (IDEQ) is in the process of determining the hydrological boundaries for all Idaho communities for the purpose of protecting drinking water (IDEQ Oct. 1999). The University of Idaho has subcontracted the delineations for groundwater communities within the study area, with the exception of Ferdinand and Craigmont, which were performed by IDEQ as pilot or test sites.

The delineation status is the degree of completeness of source delineation for the water sources as determined by the IDEQ State Office in Boise. The study proposal was presented to the city councils of each of the 12 potential volunteer communities, and the following nine volunteered to participate through a city council vote:

COMMUNITY	POPULATION	WATER SOURCE	Delineation Status
Lapwai	1134	2 wells	Complete*
Culdesac	390	2 wells	Complete*
Winchester	317	3 wells	Complete*
Nezperce	544	2 wells	Complete*
Craigmont	559	2 wells	Complete
Ferdinand	160	2 wells	Complete
Orofino	3237	Clearwater R.	Complete
Stites	308	2 wells	Incomplete
Kooskia	739	4 wells	Incomplete

*DRAFT pending review by the IDEQ State Office

Community-Designed Tools

In order for the protection tools to be representative and useful to each community in specific, input from these communities was required in order to develop the methodology. A simple survey was given to the city council and those interested in water and land use. Four questions were asked, and a list of possible answers provided. The respondents were instructed to check as

many as applied, and were given opportunity both on the survey and in the interviews to give answers that were not listed. All of the communities elected to appoint "key" persons that are knowledgeable about the community land and water issues. Key appointees were interviewed to provide more detailed information.

Survey: The survey was designed to obtain the following local viewpoints on:

- Major drinking water and land protection issues facing the community.
- Information needed to resolve the major issues.
- Data generating/managing entities the community is most comfortable in working with.
- What data generating/managing entities can do to better assist in water protection.

Interviews: Key appointees gave detailed and expanded reference to the following:

- Each community's available computer and technical resources
- Specific data needs and a format that would assist in meeting water protection needs
- Specific management entity link structure that will provide future information updates

Survey and Interview Results

The results indicated that the biggest issues facing them in protecting drinking water sources were financial (76%), contamination (44%) and political/jurisdictional (39%). The communities specified that they are comfortable in working on drinking water protection activities with the State (79%) and County and conservation districts (47%). When asked what their resource managing entities could provide more of in order to assist them in drinking water protection the top responses were more technical assistance (81%) and more data sharing (61%). Fears regarding sharing community information and having it used to either regulate them, control them or cost them extra money was detailed in a majority of the personal interviews, as were fears that the Tribe desired to confiscate land and/or remove private property rights and very little trust in the Federal government. Overall, there was a feeling that data was needed to solve the water problems (which are land-related) accompanied by a fear of the consequences that data sharing may bring.

Simple Graphic Tools

Interviews revealed that all of the communities felt graphic representation of land and water use data would be effective information and planning tools for use in water protection. None of the communities have GIS mapping capability to directly obtain graphic information from the natural resource managing entities and other data generators. The required hardware, software and technical expertise is cost prohibitive to smaller communities.

A "project" database was created for each community using the ESRI mapping program ArcView. ArcView was selected for project portability, simplicity and widespread use among most managing entities. Large wall maps were designed using themes of interest to each specific community. The themes of interest were derived from the surveys and interviews. The following themes were selected during the interviews as overlay themes:

THEME	TYPE	Resolution	SOURCE
Land use	Landsat Image-grid	30 M cell	Inside Idaho website
Hillshade	Rastor image	30 M cell	IDEQ State Office
Topographic mosaic	Digital rastor graph	1:100,000	Inside Idaho website
Topographic quads	Digital rastor graph	1:24,000	Inside Idaho website
County roads	line		Inside Idaho website
Major roads	line		IDEQ State Office
Ownership	polygon		Nez Perce Tribe
Drinking Water Source delineation	dxf file		University of Idaho
Drinking Water Source delineation	polygon		IDEQ State Office
Aquifer boundary	dxf file		University of Idaho
Groundwater contours	dxf file		University of Idaho
Groundwater nitrate	point		IDWR Boise Office
Nitrate trend	polygon		IDEQ State Office
Potential Contaminant	point		IDEQ State Office

In order to overlay all of the data and present the data in a visually understandable and scale compatible format, the files were processed as follows:

- Since a majority of data is from the State of Idaho, all files not in IDTM were re-projected as such.
- The land use image was reclassified for visual simplicity from 21 to 4 classes: water, forest, fallow/range and crop.
- The ownership file color was scheme redesigned to be compatible with the colors of the land use overlay – so that the ownership colors were easily picked out.
- The dxf file format is not compatible with the rest of the data. All dxf files were re-projected and had topology rebuilt in ArcInfo. Compatible coverages were created.
- A spatial representation of the highest recorded nitrogen levels between 1990 and 2000 was created from the point data set (well locations with recorded nitrogen levels). A grid was designed using the highest nitrogen levels as z values by using the inverse distance weighted method. Thirteen classes were created, each increasing by 5 mg/l from 0 to 65.

Draft layouts were constructed for each community ArcView project. The projects were taken to each community on a laptop for revision. The map extents, overlay themes, color and labeling parameters and map size and features were revised as specified by community members. When each community was satisfied, maps were created from the final designs. The following table details the map sizes and general themes of most interest for each community. E sized maps are 34” x 44”, D sized maps are 34” x 22”. Some data was requested in small, page sized “pocket” maps. Note that each map differs by many details such as themes of interest (i.e. some contaminants will be of concern in one community and not in another) extent or scale, color, labeling, and map features, and are not detailed here.

Community	# E size	# D size	Pocket	General Themes
Lapwai	2	2	2	Landuse/ownership, contaminants, aquifer
Culdesac	2	2	2	Landuse/ownership, hillshade/road, delineation
Winchester	2	2	2	Landuse/ownership, contaminants
Nezperce	3	2	1	Landuse/ownership, delineation, aquifer
Craigmont	2	2	1	Landuse, ownership, delineation/contaminants
Ferdinand	3	2	1	Landuse/ownership, nitrate/contaminants
Orofino	2	2	2	Sources/contaminants/roads (large areas)
Kooskia	2	2	1	Land use/ownership and contaminants
Stites	2	2	1	Land use/ownership and aquifer

The map designs fit into one of four general themes:

Landuse/Ownership: Due to complex jurisdiction, many of the communities felt it would be very helpful to visualize how the land was being used from an overall viewpoint in conjunction with the ownership type. The implementation of water protection will highly involve land use planning. The land use and ownership patterns cover large areas, and as a result were generally designed for E sized map layout.

Hillshade/Roads: Visualization of watersheds by some representation of elevation was deemed highly useful. Many that were not well-versed on the intricacies of water ecosystems, recharge and geomorphology instantly able to visual many properties of their water source areas and basins by simply looking at a fine (30 M) hillshade. Most wanted either county or major roads included as a point of reference.

Aquifer Characteristics: The source delineations (many of these just completed by the University of Idaho) were of high interest. The delineations were modeled with USEPA hydrogeological modeling software, and output files included groundwater contours and aquifer elements and boundaries as well as the 3, 6 and 10 year time of travel protection zones that are known as the source delineation. These files were overlayed on base maps of interest – topographic quads, roads, etc. The majority of aquifer parameter maps were pocket sized.

Potential Contaminants: Most of the communities on the Camas Prairie (south-east central part of study area) are interested in nitrates. The State monitoring program has determined very high levels in the deep aquifer in that area (IDWR 2000). Most communities chose a D sized map showing the surrounding area and potential contaminant types. The potential contaminant coverage is from a State database that is expected to be updated and ground-truthed at the community level (since businesses change and move). In general, communities showed preference to do their own local contaminant inventories (this will be part of the protection plan implementation in the next phase of research). For the large extent map the contaminants were labeled as to category only. For instance, a gravel pit is depicted on the map with a symbol and legend for gravel pits, but is not labeled with the owner name of the gravel pit. The local extent

map will have the source protection zone over road infrastructure, affording the "marking" or labeling of their local inventory within their drinking water protection areas.

Most of the communities asked for a pocket map that listed owner names from the State Contaminant Inventory. In this way they could ensure that the listed businesses are still located there, and locate any that are not listed (the State potential contaminant database will be updated this way).

Data Partners

State of Idaho: The results of the interviews and surveys indicated almost unanimously that the communities would like their projects to be accessible from the Idaho Department of Environmental Quality. The State of Idaho has been extremely willing to share the majority of the data used for this project, and will be highly encouraging to the communities in their protection awareness and implementation efforts.

Conservation Districts: The soil conservation districts have many land use projects and initiatives that are ongoing in this area, and many landowners participate. The conservation districts are very willing to assist in any efforts made at land or water conservation practices, and will be able to assist the communities (who already have a good relationship with the districts) in putting the spatial data to on-the-ground use.

Counties: The counties are likely one of the best units for implementing zoning/land use restructuring. There are five counties represented within the Nez Perce Reservation boundaries, Latah, Nezperce, Lewis, Clearwater and Idaho. Often the GIS data from the counties is very regional in nature, such as water, forest and fire protection boundaries.

Nez Perce Tribe: The Nez Perce Tribe has an extensive and excellent Natural Resource Division, with a technically progressive GIS program. The Tribe has been very willing to share data for this and many other projects, and is highly cooperative and interested in water protection in this area. Upon closing interviews, many were surprised and happy that the Tribe was so willing to share data and to be of assistance.

Federal Programs: Although there are few public lands within the Reservation in comparison with surrounding areas, the reservation itself falls under Federal program protection for many environmental and land programs. The USGS has supported this project with both funding and data, and likely other Federal entities will be highly cooperative in data sharing and assistance. Trust in Federal programs will likely increase as more Federal data is shared and the communities realize the widespread "partnership approach" that many Federal programs have adopted.

Easy Data Updates

The Regional Office in Lewiston holds the individual community projects for future information updates. In addition, assistance can be given in explaining the chemical categories that are listed

in the State potential contaminant inventory database (represented on the community maps). A simple user-friendly interface has been built into the ArcView projects in order to make it easy to perform tasks such as re-defining map-extents, making new views and layouts, and adding or deleting themes of interest from the project.

Principal Findings and Significance:

Drinking water protection is essentially an exercise in determining what land surfaces must be protected in order to protect a water source. The techniques that are being used for water protection planning by the Federal government, delegated States and contractors is a tried and true methodology. The process of community request for spatial data and development of their own mapping tools is simple and need not be costly. It additionally strengthens the partnerships between resource managers and land user constituents, and helps foster the goals of drinking water protection that are the responsibility of government entities.

GIS tools such as maps are extremely important and useful tools. There is a lot of good data generated by resource managing entities that can be easily grasped and quickly understood without a steep learning curve. Yet, even these great mapping tools are not of much benefit to people unless the information depicted is meaningful and useful to the viewer. For example, a large monitoring program may depict high contaminant levels in a certain area. It will be very useful to provide a map to an affected community that depicts high concentrations. Finding land solutions that work will be enhanced by the community requesting the information of local import – such as springs, farmlands and other features that are known. The integration of the data from the resource manager and the innate knowledge of the local allow for easy problem recognition and resulting solution alternatives.

The communities in this sparsely populated, agricultural area are faced with the task of addressing land use issues and finding solutions that will be effective. Because the land ownership patterns are complex, effective solutions will necessitate a cooperative approach. The significance of finding drinking water protection tools that can work to bridge resource data with local knowledge is that they are applicable anywhere.

It was highly rewarding to watch the progression and fast learning track exhibited by the community member participants. As the information was shared with them, filling in the pieces for them on things already understood on a very micro-scale level, their trust level increased dramatically. Though there may be disagreement on problem resolution, the open forum for discussing alternatives will more easily be forged with the graphic information tools in view.

The issues identified by the community members who completed the survey are their issues, the ones of high import in their own particular locale. It was not unexpected that funding, contaminants, ownership, and infrastructure were high on the list of concerns identified by the community members. What is surprising is the degree of interest and understanding that a truly community-created, creative (replace with designed) set of tools evokes. Those that live in the locale are the ones that know the land - it's history, and intricacies. With visualization of the factors that influence drinking water protection they are more able to devise solutions that will

work. One final observation garnered in this phase of the research is that the land/water protection process does not work in a vacuum. The communities indicate that they will work most comfortably with those that they are comfortable with, such as resource managers that also know the area.

In related research beginning March, 2002, we will continue to benchmark the successful markers for continuing volunteer communities that utilize the graphic tools and data partnerships to design creative, action-oriented approaches to water protection.

Bentz, Brandon, 1998. *A Reconnaissance of Nitrite/Nitrate in Camas Prairie Ground Water Volume I*, Lewis and Idaho County, Idaho, Idaho Division of Environmental Quality Lewiston Regional Office, September.

Crockett, J.K., 1995. *Idaho Statewide Ground Water Quality Monitoring Program, Summary of Results 1991 – 1993*, Idaho Department of Water Resources, Water Information Bulletin No. 50, Part 2.

IDEQ Lewiston Regional Office, September 2000. Drinking Water Inventory System records.

IDEQ State Office, October, 1999. Idaho Source Water Assessment Plan

IDEQ State Office, May 2000. Groundwater nitrogen trend spatial data, Electronic transmission.

IDEQ State Office, August 2000. 30 meter hillshade image. Electronic transmission.

IDEQ State Office, October 2000. Potential contaminant inventory shapefiles. Electronic Transmission. This is not considered a complete listing of potential contaminants. Part of the State Sourcewater Assessment process involves the communities themselves Conducting a local and more complete contaminant inventory as part of source Protection plan certification.

IDEQ State Office, January 2001. Major road shapefile. Electronic transmission.

IDEQ State Office, January 2001. Orofino surface water source delineation shapefile. Electronic Transmission.

Inside Idaho Website, April 2000. http://inside2.uidaho.edu/asp/theme.asp

IDWR Boise Office, June 2000. Groundwater nitrogen levels spatial data from the Statewide Ambient Groundwater Monitoring Program. Electronic transmission.

Nez Perce Tribe of Idaho, January 2001. Ownership coverage. Electronic transmission.

Spatial Dynamics, 1999. Nez Perce Tribe Land Cover. Nez Perce Tribe, Lapwai, Idaho. GIS Coverage.

United States Census 2000, released 2001

Future work: The next step is further testing the community design process. Out of the nine communities that participate in the graphic tool portion, several volunteers will go on to design action oriented water protection processes that work for their specific area and issues. Developing cooperative links and infrastructure with the data partners will be integral to this approach.